UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/859,513	05/18/2001	Keizo Hosoda	208578US0	4271

22850 7590 12/19/2002

OBLON SPIVAK MCCLELLAND MAIER & NEUSTADT PC
FOURTH FLOOR
1755 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VA 22202

EXAMINER
BEREZNY, NEAL

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 12/19/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/859,513	Applicant(s) HOSODA ET AL.	
	Examiner Neal Berezny	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 May 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 May 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1, 3-5, 7-9, and 12-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Independent claims 1, 5, and 9, contain a limitation based on the crystallization temperature of the TaO, but it is unclear as to what specific temperature is being claimed. Different crystal phases possess different crystallization temperature, which also vary as a function of pressure.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-2 and 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamiyama (5.352,623) in combination with Carl et al. (5,468,687). Kamiyama teaches a method of manufacturing a capacitor having a tantalum oxide film as an insulating film, col.3, ln.22-25, said method comprising: a vapor-phase depositing a tantalum oxide film on a lower electrically conductive film; col.4, ln.16-18, treating

the tantalum oxide film with a plasma; while annealing the tantalum oxide film being treated with the active oxygen species, at a temperature lower than a crystallization temperature of tantalum oxide by 10°C to 80°C in an inert atmosphere; col.4, ln.54-68, and forming an upper electrically conductive film on the annealed tantalum oxide film, col.5, ln.7-13, wherein the said annealing is conducted at a temperature of about 620°C to about 690 C, col.4, ln.60-62.

5. Kamiyama does not appear to specifically state that the treatment step and the anneal step are conducted separately, nor that the plasma consists of an active oxygen species. Carl teaches a very similar process to Kamiyama, except that Carl specifically teaches the use of ozone, col.2, ln.40-50. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine Carl with Kamiyama in order to use lower oxygen stuffing temperatures to reduce the oxidation of nearby polysilicon, degrading the dielectric properties of the TaO, see Carl, col.1, ln.27-38. Further, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Kamiyama and Carl to perform both steps, treating and annealing, separately, since it has been found that constructing a formerly integral process into various process steps involves only

routine skill in the art. *Nerwin v. Erlichman,* 168 USPQ 177, 179.

6. Claims 9-11 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamiyama and Carl as applied to claims 1-2 and 5-6 above, and further in view of Doklan et al. (4,851,370). Kamiyama and Carl do not specifically teach the formation and treatments and anneals of multiple layers of TaO layers. Doklan teaches forming low defect density oxides for capacitors containing multiple layers of oxide, see abstract and fig.1. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine Doklan with Kamiyama and Carl to form a capacitor dielectric containing multiple layers of TaO, thus performing multiple sets of deposition, treatment, and annealing steps, in order to form separate and distinct layers, each layer having its own distinct defect pattern, which when overlapped would result in most of the defects being misaligned, thus forming a structure with fewer defect that completely traverse the dielectric, thus reducing leakage currents and device failures, see Doklan, col.2, ln.46-62.

7. Claims 3-4, 7-8, and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamiyama, Carl, and Doklan as applied to claims 1-2, 5-6, 9-11, and 14 above, and further in view of Shinriki et al. (5,521,423). Kamiyama, Carl, and Doklan appear not to specifically teach the use of a lower electrically conductive film formed of a metal-based electrically conductive material,

wherein said metal-based material is selected from ruthenium, tungsten, aluminum, platinum, tungsten nitride, titanium nitride, and titanium silicon nitride.

8. Shinriki teaches the use of a lower electrically conductive film formed of a metal-based electrically conductive material, wherein said metal-based material is selected from ruthenium, tungsten, aluminum, platinum, tungsten nitride, titanium nitride, and titanium silicon nitride, col.2, ln.50-61. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine Shinriki with Kamiyama, Carl, and Doklan to form a lower electrode made of a metal or metal nitride in order to lower the resistivity of the capacitor, thus lowering the RC constant of the device and thus allowing the device to function faster. Further, the nitrided metals would help prevent the oxidation of the electrode under the TaOxide, thus keeping the capacitance of the capacitor high.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Neal Berezny whose telephone number is (703) 305-1481. The examiner can normally be reached on M-F 9:00 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone

numbers for the organization where this application or proceeding is assigned are (703) 308-7724 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

NB
December 15, 2002

Olik Chaudhuri
Supervisory Patent Examiner
Technology Center 2800